SCIENCE.—SUPPLEMENT.

FRIDAY, APRIL 2, 1886.

INDUCED SOMNAMBULISM.

THE activity with which the study of mental phenomena, and especially of hypnotism, is now being pursued, is remarkable. Constantly publications are being brought to our notice, dealing with these popular topics, either in a literary, an empirical, or scientific way. Among the last to claim attention is a little work[1] by Prof. H. Beaunis of the faculty of medicine at Nancy, who has attempted to apply to the study of induced somnambulism scientific experimental methods. His work deals with the question from both physiological and psychological points of view, and treats of both mental and physical conditions. The substance of his more important observations and deductions, in the concluding chapters, is here presented.

What is the mental state of the hypnotized person during sleep? Is the intelligence active, and are the thoughts of the subject engaged? Observations seem to show that there is an absolute repose of the thoughts, except when under the influence of external impressions. When a hypnotized subject is asked of what he is thinking, the response is nearly always, 'Of nothing.' There is a state of intellectual inertia, or, better, of intellectual repose, in accord with the physical aspect of the hypnotized person: the body is immovable, the features impassible, with a general expression of calmness and tranquillity rarely attained in ordinary sleep. There are evidently no dreams nor thoughts of any kind; for those subjects who recollect very well whatever has transpired in some previous like condition recall nothing of an hypnotic sleep during which there have been received no external impressions.

Thus, contrary to the opinion of many physicians, undisturbed hypnotic sleep may be regarded as more recuperative; and from the observations made, both by the author and Dr. Liébeault, a part of the therapeutic effects produced by hypnotism may be attributed to the beneficial character of the induced sleep. It is often asked whether, in ordinary sleep, the brain remains inactive, and many reasons have been given to prove the contrary. Facts, however, seem to show, that, when it is profound, the brain is really as inactive as in the induced sleep.

This inertia of thought is, however, only a conditional one in hypnotism: the merest suggestion, a single word pronounced by the hypnotizer, suffices to produce an activity that may be very highly developed, sometimes even more than in the normal state. The judgment of the hypnotized person is good, and in general he reasons correctly and logically. "That which is the most striking," says Dr. Liébeault, "is his power of deduction: whatever may be the result of his intellectual elaboration, his train of reasoning is logical and rapid." It seems, then, incorrect to consider the hypnotized person as an unconscious machine, incapable of reasoning and of judgment, as Pitres has done. It is true, he lacks the impelling motive; but impulsion once given, the intellectual machine is set in motion with more regularity and precision than in the waking state even.

The author says, however, that he has never observed the marvellous phenomena admitted by certain magnetizers, such as mental divination, second sight, prophetic powers, etc. The subjects were never able to divine the nature of an object enclosed in the hand, nor to tell one's thoughts, or events that had transpired unknown to them. In regard to predictions, the same was likewise true: a subject was never able to announce any event in advance in which the prediction was realized. A fact which the author has tested many times, and which seems to admit of no doubt, is that certain subjects are able to recognize by the touch, or at least without the aid of sight or hearing, the sex and approximate age of persons with whom they come in contact; and in many cases the subject was able to designate immediately, upon seeing persons unknown to them, the nature and location of maladies under which they were suffering. All such facts of hypnotism, however strange they appear, may be explained by an increased activity of the senses, by an excessive sensorial sensitiveness, such as is known to occur in the somnambulist.

There is one point of special interest in the mental state of the hypnotized person which the author examined with care. Will the somnambulist prevaricate or lie while in that condition? According to Pitres, certain subjects during the hypnotic state falsify voluntarily and knowingly; but such cases were never observed by the author.

[1] *Le somnambulisme provoqué, études physiologiques et psychologiques.* Paris, *Baillière*, 1886. 12°.

Sometimes they would refuse to reply to questions, or would hesitate in answering, but in no case did he ever know of their telling a downright falsehood. Were it possible to test those naturally vicious, the results might be different; and it would be of great interest to examine, in this respect, the professional criminal. The hypnotized person, in fine, is entirely open, not only in his actions, but also in his most intimate thoughts and sentiments: every thing appears — vices, faults, virtues, passions — with entire simplicity and the most complete *naïveté*.

One of the most difficult problems in induced somnambulism is that of the relation existing between the subject and the hypnotizer. No matter how profound the sleep may be, the subject understands all that is said to him by the hypnotizer, though he may not understand that which is addressed by the latter to a third person. This relation is established through any or all of the senses. Though the hypnotizer may use the utmost precaution not to reveal his presence in taking the hand of the subject, he will immediately be recognized, and the subject will obey the impressions conveyed. Should the subject's arm be raised, it will remain in any given position, though, if done by a third person, it will fall immediately inert. Let passes be made in his immediate proximity, either in front or behind, and the subject will recognize whether they are done by the hypnotizer or some strange person. Can this be attributed to a superexcitation of the tactile sensibility? One cannot say. If the subject is asked how he knows who it is that makes these passes, he invariably replies, that he feels him. A subject may be placed *en rapport* with a third person by the simple command of the hypnotizer, when he will obey him with the same implicitness.

In what, then, does this singular phenomenon of the relation between hypnotizer and hypnotized consist? Noizet and Bertrand, together with Dr. Liébeault, accept the explanation of this affinity or relation as the result of the attention given to the hypnotizer by the subject while being placed in that condition, and that it does not differ from that seen every day in ordinary sleep. A mother sleeping near the cradle of her child does not cease to watch over it, and, though insensible to the loudest tones, is conscious of the lightest cry of her infant. By this hypothesis the imagination of the subject produces the effect, and there is no special relation, physical or physiological, between hypnotizer and hypnotized. The subject, says Carpenter, is possessed by a preconceived conviction that one particular individual is destined to exercise upon him an especial influence, and that it is the effect of a predominant idea suggested, directly or indirectly, by the magnetizer himself. Persons who hypnotize themselves for the first time, and without placing their thoughts especially upon any one person, are apt to receive the impressions of any by-stander.

Although certain facts seem to substantiate these views, there are others which are not easily explained by them, and which seem to indicate some real relation between hypnotizer and hypnotized.

Any attempt to explain these varied phenomena, or to establish some general theory of induced somnambulism, is yet premature; nor will the solution of the problem be possible till the functions of the brain, and especially the physiology of natural sleep, are better known than they are at present. One may, however, seek solutions of particular groups of phenomena.

By many authors most of the phenomena are explained by the concentration of attention, — the concentration of thought. It is well known that the mind may exert a most remarkable power over the organism, controlling or producing the most lively sensations of pain, and even causing sickness or death; but attention or concentration gives no real explanation. According to Durand de Gros, the essential feature is the suspension of all mental activity, except in some one direction; and, as nervous force continues to accumulate in the brain, there results a nervous congestion. The direction of this force in any one particular course, or to any sensorial organ, augments the activity in an extraordinary degree.

This influence of the attention and the concentration of thought in the phenomena of hypnotism may be readily accepted, especially so far as they concern the sensations; but there are facts that are not easily explained by them. One may understand that a hypnotized person, under the influence of an immediate impression, may believe that he sees or hears an absent person; but how can the fact be explained that the subject will see or hear him at a certain time, a week or more distant, when he has been so told by the hypnotizer? Does the hallucination rest wholly in abeyance during these days, to re-appear at a fixed time? Has there been a concentration of thought during all this time?

There are also other facts that must be taken into consideration. How does concentration of thought cause certain physiological phenomena, such as variations in the beating of the heart, redness and congestion of the skin, the production of blisters, etc., which are known to occur in the hypnotic state? Neither the will alone, nor suggestions from without, seem to be sufficient to

explain them. There must be some modification of the cerebral innervation, a receptivity and an aptitude very different from those in the normal state.

A distinct and strong impression must be made upon the somnambulist in order to command his attention, — a nervous shock arresting the course of his thoughts. This cerebral shock, if it may be so expressed, seems to be the *sine qua non* of success: it produces a sort of cerebral modification, some particular unknown state, without which impressions can have no effect. It is of interest to inquire whether we do not find analogous physiological or pathological states. There would seem to be certain features of surgical shock following severe operations, and causing singular conditions of mental alienation, that are similar; and is there not also a resemblance shown in the condition of deep mental abstraction witnessed in some persons? The characteristic trait of all these different conditions is a momentary suspension, more or less complete, of cerebral activity. This suspension may present all varying degrees, from the profound collapse following surgical operation, to the simple mental distraction.

THE NATURE OF SO-CALLED DOUBLE CONSCIOUSNESS AND TRIPLE CONSCIOUSNESS.

THERE is a rather widely spread impression that human beings can be subjects of double consciousness, and can lead two separate lives, in each of which the individual has a distinct set of personal characteristics. Illustrations of this supposed psychological possibility are found in many recent works of fiction, notably in the 'Archibald Malmaison' of Julian Hawthorne, and 'Called back' of Hugh Conway. Some medico-legal interest has also been attached to the question in a number of instances. Having had one case somewhat of this character under observation, I have been led to examine the matter critically.

There are on record in French, German, English, and American medical literature only seventeen cases whose history in any way entitles them to come under the designation of cases of double consciousness. Most of them were reported from forty to sixty years ago, and without very great accuracy in detail. An examination of all these histories, and the study of cases allied to them, lead one very positively to the conclusion that such a thing as a true double consciousness, or dual life, does not exist. There are several striking instances in which persons have lived an apparently double life, but in each case the second life represented simply a partial activity of the patient's brain. In the second and morbid state a portion, viz., the higher volitional centres, have their activity inhibited, the mind is dull, the disposition apathetic, and memory of the past is gone. Indeed, this loss of the faculty by which stored-up impressions of the past are revivified is the main psychological feature of some cases.

In 1845 Dr. Skae reported the case of a lawyer, of whom he said, "He appears to have a double consciousness, a sort of twofold existence, one half of which he spends in the rational and intelligent discharge of his duties; the other, in a state of helpless hypochondriasis, almost amounting to complete aberration." His attacks occurred every other day. In the classical case reported by Azam, the patient, in one mental state, was dull, apathetic, and little better than an automaton, showing here, again, that it was a condition in which some of her mental faculties were suspended. A Kentucky farmer twenty-three years old was accidentally struck on the head with a hammer. He was unconscious for several hours, but recovered, and seemed as well as ever. He married, and had children, but, after eight years, began to show signs of insanity. He was trephined, and his mental faculties were completely restored; but the whole eight years since the blow on his head was a complete blank. He did not know his wife, or children, or any of his later associates. This was not so much a case of double consciousness, though so reported, as of loss of memory.

The theory that the two mental states correspond with special activity of one side or the other side of the brain, is not at all tenable, because, if for no other reason, one of the cerebral hemispheres may be almost entirely destroyed, or its connecting commissure may be injured or absent without producing any such phenomenon as double consciousness, or a change in personality. Besides, there have been at least two cases reported in which three different mental states occurred. One of them was recently reported by J. Voisin. A young man suffering from hysteria major had an attack of amnesia, or loss of memory, lasting for a year: there was entire forgetfulness of his past, a change in his character and demeanor. This state could be artificially changed into a third state by hypnotizing him, after which he would return to his second or abnormal state. After being restored to his normal mind for a year, he had another attack of amnesia, lasting three months, and during this time he remembered only what had happened in his previous attack.

States of double or triple consciousness are either disorders of memory, or instances of suspension of the higher volitional powers, being then cases of hypnotism or of the epileptic automatic

state. Double consciousness or triple consciousness never occurs in healthy people, but only in the hysterical, epileptic, insane, or in those who have had severe shocks or injuries to the head. Dramatists and writers of fiction should bear this in mind, if they wish to cling to the realities.

Charles L. Dana, M.D.

FOOD-ACCESSORIES: THEIR INFLUENCE ON DIGESTION.

The results of experimental inquiries on the subject of foods and food-digestion, when scientifically conducted, cannot help being of great practical importance to man, so intimately is his physical perfection and intellectual activity dependent upon his alimentation. Among the results of certain experiments on this subject by Sir W. Roberts, as given in the *Nineteenth century*, the following will be found of interest.

Man, as the author says, is a very complex feeder: he has departed, in the course of his civilization, very widely from the monotonous uniformity of diet observed in animals in the wild state. Not only does he differ from other animals in cooking his food, but he adds to his food a greater or less number of condiments for the purpose of increasing its flavor and attractiveness; but, above and beyond this, the complexity of his food-habits is greatly increased by the custom of partaking, in considerable quantity, of certain stimulants and restoratives, such as tea, coffee, cocoa, and the various alcoholic beverages, which have become essential to his social comfort, if not to his physical well-being.

But the generalized food-customs of mankind are not to be viewed as random practices adopted to please the palate or gratify our idle or vicious appetite. These customs must be regarded as the outcome of profound instincts, which correspond to important wants of the human economy. They are the fruit of colossal experience, accumulated through successive generations. They have the same weight and significance as other kindred facts of natural history, and are fitted to yield to observation and study lessons of the highest scientific and practical value.

First, with respect to the action of ardent spirits on digestion, experiments were made with 'proof-spirit,' and with brandy, Scotch whiskey, and gin; and the conclusion is, that, so far as salivary digestion is concerned, these spirits, when used in moderation and well diluted, as they usually are when employed dietetically, rather promote than retard this part of the digestive process; and this they do by causing an increased flow of saliva. The proportion must not, however, much exceed five per cent; and gin seems to be less injurious than either brandy or whiskey. It was noticed in these experiments that both of these interfered with the digestive process, precipitating the starch more readily, altogether out of proportion to the amount of alcohol they contained, and brandy was worse than whiskey; and this circumstance appears to be due to certain ethers and volatile oils in them; and brandy contains a trace of tannin, which has an intensely retarding influence on salivary digestion. Even very small quantities of the stronger and lighter wines — sherry, hock, claret, and port — exercise a powerful retarding influence on salivary digestion. This is due to the acid — not the alcohol — they contain, and if this acid be neutralized, as it often is in practice, by mixing with the wine some effervescent alkaline water, the disturbing effect on salivary digestion is removed.

In the case of vinegar, it was found that 1 part in 5,000 sensibly retarded this process, a proportion of 1 in 1,000 rendered it very slow, and of 1 in 500 arrested it completely; so that, when acid salads are taken with bread, the effect of the acid is to prevent any salivary digestion of the latter, — a matter of little moment to a person with a vigorous digestion, but to a feeble dyspeptic one of some importance. There is a very wide-spread belief that drinking vinegar is an efficacious means of avoiding getting fat; and this popular belief would appear, from these experimental observations, to be well founded. If the vinegar be taken at the same time as farinaceous food, it will greatly interfere with its digestion and assimilation.

Effervescent table-waters, if they consist simply of pure water charged with carbonic acid, exercise a considerable retarding influence on salivary digestion; but if they also contain alkaline carbonates, as most of the table-waters of commerce do, the presence of the alkali quite removes this retarding effect.

With regard to 'peptic' digestion, the results are still more surprising. It was found that with ten per cent and under, of proof-spirit, there was no appreciable retardation, and only a slight retardation with twenty per cent; but with large percentages it was very different, and with fifty per cent the digestive ferment was almost paralyzed. It was also observed that the weaker forms of alcoholic drinks (wines and beer) differed greatly in the influence on peptic digestion from that of the distilled spirits. They retarded it altogether out of proportion to the quantity of alcohol they contained. Port and sherry exercised a great retarding effect. Even in the proportion of twenty

per cent, sherry trebled the time in which digestion was completed. It should further be borne in mind that this wine also retards greatly salivary digestion. Sherry, then, is injurious for persons of feeble digestive powers. With hock, claret, and champagne, it was also ascertained that their retarding effect on digestion was out of proportion to the alcohol contained in them; but champagne was found to have a markedly less retarding effect than hock and claret, due apparently to the mechanical effects of its effervescent qualities. The quantity of claret and hock often consumed by many persons at meals must exercise a considerable retarding effect on peptic digestion; but small quantities of these wines (and even of sherry) may not produce any appreciable retarding effect, but act as pure stimulants.

With regard to malt liquors it was observed, as with wines, that they retarded peptic digestion in a degree altogether out of proportion to the amount of alcohol contained in them; and, when taken in large quantities, they must greatly retard the digestion, especially of farinaceous food.

Tea, coffee, and cocoa were found to exert varying degrees of influence on the salivary digestion. The medium strength of the tea usually drunk is estimated at four to five per cent: strong tea may contain as much as seven per cent; weak tea, as little as two per cent. Medium coffee has a strength of about seven per cent, and strong coffee twelve to fifteen per cent; cocoa, on the other hand, is generally weaker, not more than about two per cent, and this may be one reason why it is more suitable to persons with feeble digestions than tea or coffee. Tea exercises a powerful inhibitory effect on salivary digestion, and this appears to be entirely due to the large quantity of tannin it contains; and, in order to diminish as far as possible its retarding influence on salivary digestion, it should be made weak and used sparingly, and it should not be taken with, but after, the meal. Coffee, unless taken in very large quantity, has very little retarding effect on salivary digestion: this is explained by the fact that the tannin of tea is replaced in coffee by a substance called caffeo-tannic acid. Cocoa resembles coffee, and has little or no effect on salivary digestion: the use of coffee or cocoa is therefore preferable to that of tea, for persons of feeble digestion.

With respect to the influence of tea and coffee on stomach digestion, it was found that they both exercised a remarkable retarding effect. There was no appreciable difference in the two beverages if they were of equal strength; but, as coffee is usually made of greater percentage strength than tea, its effect must ordinarily be greater. Cocoa also had much the same effect if used of the same strength as tea or coffee; but when of the strength ordinarily employed, its effect was inconsiderable. Strong coffee — *café noir* — had a very powerful retarding effect, and persons of weak digestion should avoid the customary cup of 'black coffee' after dinner.

Perhaps one of the most unexpected results of these experiments was the discovery that beef-tea had a powerful retarding effect on peptic digestion, as much so as that of a five-per-cent infusion of tea. Further researches appear to show that this retarding effect of beef-tea was due to the salts of the organic acids contained in it. Beef-tea contains but very little nutritive properties, and must therefore be looked upon rather as a stimulant and restorative than as a nutrient beverage, but it is nevertheless very valuable on account of those properties.

The author holds the view, that, in healthy and strong persons, the retarding effect on digestion, observed to be produced by many of the most commonly consumed food-accessories, answers a distinctly useful end. They serve, he maintains, the purpose of wholesomely slowing the otherwise too rapid digestion and absorption of copious meals. A too rapid digestion and absorption of food may be compared to feeding a fire with straw instead of slower-burning coal. In the former case it would be necessary to feed often and little, and the process would be wasteful of the fuel; for the short-lived blaze would carry most of the heat up the chimney. To burn fuel economically, and to utilize the heat to the utmost, the fire must be damped down, so as to insure slow as well as complete combustion. So with human digestion: our highly prepared and highly cooked food requires, in the healthy and vigorous, that the digestive fires should be damped down, in order to insure the economical use of food. We render food by preparation as capable as possible of being completely exhausted of its nutrient properties; and, on the other hand, to prevent this nutrient matter from being wastefully hurried through the body, we make use of agents which abate the speed of digestion.

These remarks will apply, however, only to those who possess a healthy and active digestion. To the feeble and dyspetic any food-accessory which adds to the labor and prolongs the time of digestion must be prejudicial; and it is a matter of common experience that beverages which in quantity retard digestion have to be avoided altogether by such persons, or partaken of very sparingly.

DEATH-RATE AND SANITATION IN RUSSIA.

A series of admirable articles on vital statistics and the importance of sanitary measures is now appearing in one of the St. Petersburg daily papers, says the *Lancet*, founded on a paper by Dr. Eck. The statistics given are certainly of a nature to set every one in Russia thinking seriously about taking measures to improve them. Thus for the year 1882, which seems to be the last year whose vital statistics are available, the mortality in the ten southern provinces was 2.6 per cent; in the seven eastern provinces, 3.9 per cent; in the thirteen middle provinces, 6.2 per cent; in the sixteen western provinces, 3.1 per cent; and in the fourteen northern provinces, 3.7 per cent. After mentioning the various sanitary improvements called for, as drainage of various kinds, a supply of wholesome drinking-water, attention to and regulations about buildings of all descriptions, and the establishment of infectious hospitals, Dr. Eck goes on to say: "There is no need for us to puzzle ourselves how these matters are to be done; England has accomplished so much, that we need simply adapt what is ready to our hands to our own circumstances. In Germany, France, Austria, and Italy, steps are already being taken in the same direction, and all these countries take England as their chief model, so that we need not be ashamed to do so too." He then appeals to the economic importance to Russia of a reduction of the mortality.

On the principle of example being better than precept, he goes into a long but easily comprehensible calculation of the comparative working-value of horses whose ages at death vary; and he then takes the respective death-rates of Russia (35), Germany (27), and England (19), and, by means of a method of computation unusual amongst British statisticians, explains that they show that an Englishman has 53 years of life, while a German has 37, and a Russian 29 only. Reckoning a man's working-years to commence at the age of 18, an Englishman has 35 years in which to earn, against the Russian's 11; and the latter will probably not save much more in his 11 working-years, above what it costs him to live, than has been already expended upon him during his 18 unproductive years; but an Englishman will have 24 years more in which to go on earning and saving. Again, out of 1,000 inhabitants in Russia, only 373, or 37 per cent, are of an age to earn, while in England there are 660, or 66 per cent; or each individual of working-age in Russia has to provide for two non-workers, while in England he has only half a non-worker for whom to be responsible.

MUIR'S THERMAL CHEMISTRY.

The recognition of the dual character of the phenomena involved in chemical operations is no new thing; but it is only of late that the attempt has been made to determine the relationship between transformations of matter and concurrent changes of energy, and the efforts to this end have been made almost wholly in the direction of thermal phenomena, — in the investigation of the quantities of heat which enter or leave a chemical system during the transition between accurately defined initial and final states, in a so-called chemical change.

Mr. Muir's presentation of the condition and aims of the thermal chemistry of to-day is opportune. Based as a matter of necessity upon the researches of Thomsen and Berthelot, it fairly bristles with references to the works of these masters, and, indeed, to all original papers of importance in the discussion of the subject. Following an outline sketch of the theory of energy and the molecular hypothesis, the author discusses successively the methods of thermal experimentation and their application to the phenomena of allotropy; isomerism; the neutralization of acids by bases, and bases by acids; the relative avidity (as Thomsen terms it) of acids; the classification of elements and compounds in accordance with thermo-chemical properties; the phenomena of melting, boiling, evaporation, dissociation, solution, and hydration; and, finally, the chemical interpretation of thermal data. Only such facts as are immediately of use for purposes of illustration appear in the body of the book; but all well-established data of the subject (excepting such as relate to boiling and melting points and specific heats, for which reference elsewhere is made) are to be found in the five appendices, which comprise a third of the matter between the covers of the volume.

The work is for the most part independent in opinion, and, with no pretence to exhaustiveness, sufficiently full for the purposes of the general reader, and quite intelligible to one acquainted with the elements of general chemistry and modern ideas of energy. Facts are presented fearlessly and as separate as may be from the constraint of theory, and the explanation is fitted to the facts.

The stumbling-block in the way of the interpretation of thermal values is the difficulty, often the impossibility, of determining what portion of a thermal change is of chemical origin, and what is physical; and it is not surprising to find the use

The elements of thermal chemistry. By M. M. Pattison Muir, assisted by David Muir Wilson. London, *Macmillan*, 1885. 8°.

of thermal relations in the matter of classification regarded as only supplementary, and even the 'law of maximum work' degraded to a mild assertion of the general probability of the occurrence, under physical conditions as nearly constant as possible, of that one of conceivable operations which shall evolve the greatest quantity of heat. Fortunately in the measure of relative affinities the effect of physical disturbance is at a minimum; and it is on this line that the author predicts, and rightly, as it seems, the surest advance. Mr. Muir has laid his audience under obligations; and, in view of the excellence of the work, some few depreciatory (perhaps quixotic) references to the baleful influences of structural chemistry and the bond theory will doubtless be passed over lightly.

NEW YORK AGRICULTURAL EXPERIMENT-STATION.

THE fourth report of the New York experiment-station contains the results of a vast amount of work upon various branches of agricultural inquiry; and, if the first impression which it makes is of a certain vagueness and lack of definiteness in its conclusions, a further study shows that much of this effect is due to the magnitude of the problems attacked, and the consequent incomplete character of the work at present.

As in former years, the work of the station has been largely botanical and horticultural in its nature, although other subjects have also received considerable attention, particularly stock-feeding and related subjects.

The work of the chemist upon the relative volume of the fat-globules in milk from different sources, and upon the structure of these globules, is full of interesting and suggestive results. By means of an ingenious method of his own devising, he has been able to determine microscopically the number of fat-globules in a given bulk of milk, and, by combination with the results of chemical analysis, their average volume. By this method he has shown, that, when milk is churned at a temperature above the melting-point of butter-fat, the number of fat-globules is increased: in other words, the fat-globules can be divided. He has thus, it would seem, disposed finally of the theory of a membrane surrounding the fat-globules, and completed the proof that milk is an emulsion, and behaves essentially like any other emulsion.

Fourth annual report of the Board of control of the New York agricultural experiment-station, for the year 1885; with the reports of the director and officers. Rochester, N.Y., *E. R. Andrews, pr.*, 1886. 8°.

But it is on the botanical and horticultural sides, as already intimated, that we find the greatest amount of work expended, and the most comprehensive plan of operations. There are, among other things, a botanical description and provisional classification of forty-three varieties of wheat, and a description of the leading varieties of lettuce (eighty-seven in number, according to the station's classification, and gleaned from at least two hundred differently named lettuces by the labor of three seasons). There is also a description of the products of a hundred and forty-eight varieties of maize, planted under such conditions as to insure extensive cross-fertilization, and tending to show that the variations thus produced can be referred to named varieties. All this, it will be observed, is in the line of agricultural botany; and the report contains the records of a large amount of other work, with many species of plants which may sooner or later be available in the same direction.

We shall watch with interest this attempt to reduce to system the present chaos in the nomenclature of agricultural varieties. The director of the New York station is confident that these varieties are much more persistent than is usually supposed; and, in the interest of both science and practice, it is to be hoped that his confidence will be justified by the outcome of his own and his assistant's labor.

The report of the botanist deals largely with plant-diseases, the most interesting portion being the demonstration that pear-blight is due to the activity of a bacterium.

The student of agricultural science may be inclined to regret the time which has been spent upon numerous side-issues and single experiments of no scientific value, and to wish that the large resources of the station had been expended in more extended and thorough scientific work upon a few problems; but he will not forget that a public experiment-station is not a purely scientific institution, but has duties to the man of practice as well, which are often best subserved by experiments, in which the purely scientific man can see no value. We have before now taken occasion to express freely our belief in the greater ultimate value of scientific investigation; but we desire to record also our appreciation of the value of carefully performed and conscientiously reported 'practical' or 'empirical' experiments, such as are to be found in this report. The New York station appears to us to be doing excellent work in both directions, and it is to be hoped that the liberality of the state in providing means for its prosecution will serve as an incentive to other commonwealths.

MINOR BOOK NOTICES.

Climatology and mineral waters of the United States. By A. N. Bell. New York, *Wood*, 1886. 8°.

This is a work intended especially to present ascertained facts so as to render them available for the promotion of health. In addition to a full and readable discussion of the different meteorological agencies and factors, the author deals with the climatological topography of the different regions of the United States, with weather reviews, and descriptions of the different medicinal waters. To the invalid the work will have its greatest, and we believe a real, value; but to all who are interested in the influences of climate upon health, or even in general meteorology, it will be found very useful. The author arrives at the conclusion that no country in the world possesses a greater variety of climate or climates with a higher degree of salubrity than the United States.

Statics and dynamics for engineering students. By Irving P. Church. New York, *Wiley*, 1886. 8°.

This book, so far as one can judge from the contents, since there is no preface, is intended for use as an elementary text-book in theoretical mechanics by students who are to get elsewhere a good deal of practice in solving problems, and some additional instruction. The text is, on the whole, very clearly written, the diagrams are excellent, and the illustrative examples cannot fail to interest the reader as well as to instruct him. The use of the phrase 'square second' instead of 'per second per second,' in such expressions as "an acceleration equal to 32.2 feet per square second," will probably be new to most engineers. The few typographical errors which we have noticed in text and formulas are not misleading, although the insertion of the few words which have evidently fallen out of the last paragraph on p. 18 might help a beginner.

Drainage for health; or, Easy lessons in sanitary science. By Joseph Wilson. Philadelphia, *Blakiston*, 1886. 8°.

This is a revised edition of a work on drainage, house-plumbing, etc. It is written in quaint, laconic style, and impresses the reader with having been prepared by one of pronounced opinions. In some parts it is excessive, and as a literary model can hardly be recommended; nevertheless it contains some very good advice and instructions.

De la désinfection des wagons ayant servi au transport des animaux. By Dr. Paul Redard. Paris, *Doin*, 1885. 8°.

This is a work that should be of service in America, where the questions of cattle transportation have frequently been of no little importance. The work treats of the danger of transportation of diseased cattle in railroad-cars, with evidence of the diffusion of epizoötic diseases from such. It gives also the principal European laws regulating the disinfection of cattle-cars with the comparative values of the different means employed. The author concludes that the various chemical agents, such as phenic acid, chloride and sulphate of zinc, sulphur, etc., are inefficacious. The results obtained by superheated steam (230° F.) were constant and successful. He describes methods by which disinfection may thus be accomplished with speed and certainty.

Mechanical integrators, including the various forms of planimeters. By Prof. H. S. H. Shaw. New York, *Van Nostrand*, 1886. 24°.

In this convenient little book we have a systematic presentation of the principles on which mechanical integrators and the various forms of planimeters are based. The divisions of the book are as follows; planimeters in which slipping of the measuring roller takes place; planimeters in which only pure rolling motion is assumed to take place; moment planimeters; continuous integrators; limits of accuracy of integrators, both theoretical and experimental. Many forms of these instruments are described, and a host of inventors named from all countries. Among them Professor Amsler still holds the first place for the variety of his inventions, and their adaptability to a wide range of calculations, — to finding areas, average pressure on indicator diagrams, centre of gravity, contents of embankments, etc. From his works at Schaffhausen, more than twelve thousand polar planimeters have been sent out. This paper was originally presented before the Institution of civil engineers, and the report of the discussion that followed it contains many interesting practical points with reference to the use of these instruments. As the importance of such mechanical aids in calculation is becoming more and more felt, a book like this is useful and welcome.

It is not often that a well-known scientific man has the melancholy pleasure of reading obituary notices of himself, as appears to have been the case with Dr. J. Jacob v. Tschudi, the South American explorer. *Natur* now corrects the error by stating that it was his brother, Friedrich von Tschudi, who died at St. Gall, Switzerland, on Jan. 24 last. Friedrich, though less known to American readers, did much good work in natural history of a popular or general character, the most important of which was his '*Thierleben der Alpenwelt*.' He was nearly sixty-four years of age. J. J. v. Tschudi, though four years his senior, is still actively engaged in research, as the frequent papers from his pen attest.